Appendix D
RIPARIAN CONSERVATION OBJECTIVE ANALYSIS

Sagehen Project
Truckee Ranger District
Tahoe National Forest

Introduction

The Sierra Nevada Forest Plan Amendment (SNFPA), Final Supplemental Environmental Impact Statement, Record of Decision (USDA 2004) requires that a site-specific project-level analysis be conducted to determine whether activities proposed within Riparian Conservation Areas (RCAs) meet the Riparian Conservation Objectives (RCOs). This document presents the results of the RCO analysis for the Sagehen Project. The following analysis examines how the Proposed Action and other alternatives for the Sagehen Project meet the Riparian Conservation Objectives.

Measures incorporated into this analysis to attain RCO's include Riparian Conservation Area (RCA), Tractor Keep Out(TKO) and Waterbody Buffer Zone (WBZ) designations. Each of these designations have specific roles in either a regulatory sense or or as an aid in meeting objectives within the RCA. The RCA areas are management zones within which the objectives of the RCO must be met. RCA's are defined in detail later in this analysis.

The WBZ is defined by the Lahontan Water Quality Control Board and is a width that is associated with the class of water determined by the benificial use and hydrologic characteristics. Where the term waterbody is used as one word it designates the definition based on the Lahontan Water Quality Control Board. The waterbody class is assoicated with a WBZ and it is used to determine what activities are being conducted within the WBZ. The activities to be conducted within the WBZ aid in determining the Timber Waiver Class that is applied for through the Lahontan Water Quality Control Board . A table that compares the RCA width designations and the WBZ designations is presented in Table 2 below. For most scenarios the RCA width is greater than the WBZ.

The TKO is a designation that limits activites within a RCA for nearly all cases this designation limts entries into the 100 year floodplain and excludes equipment access away from sensitive areas and out of the100 year flood plain. The only exception is where stream crossings are needed for operability, and these are pre-approved crossings that meet the SMRs 4 and 6. The TKO generally defines an area where mechanical equipment is excluded. Usually refers to an area where both feller-bunchers and skidders are excluded. The TKO could be considered to be similar to the previously used term Stream Side Management Zone which was typically an equipment keep out area. Marked trees inside the TKO can be removed by reaching in with equipment or may be endlined if unacceptable resource damage does not result.

In general,TKOs are measured based on the greatest distance from the following features: channel bank, wet soil type associated with a floodplain, spring or meadow, riparian vegetation, steepened slope break adjacent to channel. Widths may be increased along incised channels and where the slope directly adjacent to the channel increases. The TKO will be increased where hydrologic features merge or drainage becomes complex, and may use a special designation called "controlled access" area. This area is used to designate that the eqipment patterns used for

timber removal be laid out in advance and follow requirements such as entering perpendicular to the drainage.

Special Designations: Sagehen Creek is recommended as a National Wild and Scenic River System with the Scenic Designation applied to eight miles of Sagehen Creek extending over a 1/4 mile-wide strip on each side of the centerline of Sagehen Creek from its headwaters to where it enters Stampede Reservoir. There are 2,451 acres of National Forest System (NFS) lands and no acres of private lands within the eligible Sagehen Scenic river corridor. Scenic corridors are "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads". The designation would also incorporate Management Area 043 (Sagehen Station) which is described in the Tahoe Forest Land and Resource Management Plan (TNF LRMP) (USDA 1990). Until such time when Congress either designates or removes Sagehen Creek from eligibility as a wild and scenic corridor, the corridor is to be treated to retain existing Outstanding Remarkable (OR) values. OR values were identified within the Eight Eastside Rivers Wild and Scenic River Study Report and Final Environmental Impact Statement Record of Decision (USDA 1999) as best ecological botanical value of the eastside rivers ecosystem. Values included hydrology, geology, wildlife, fisheries, and plants with biological diversity (associated with fens), historical values, natural native fish and rare caddis fly species. The OR values would be maintained through the proposed action and alternatives as described in this RCO analysis.

Additionally Special Interest Areas of the Sagehen Basin include include the Mason Fen and Sagehen Headwaters. The Mason Fen (30 acres) represents the largest fen in the Sagehen Basin vicinity and has a unique botanical assemblage. The Sagehen Headwaters area (79 acres) is located in an intact glacial cirque basin (Section 16, T .18N., R.15E.). The glacial cirque gives rise to fens and bogs which are part of a complex hydrological system.

Riparian Conservation Areas

As defined in the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004), RCAs "are land allocations that are managed to maintain or restore the structure and function of aquatic, riparian, and meadow ecosystems. The intent of management direction for RCAs is to (1) preserve, enhance, and restore habitat for riparian- and aquatic-dependent species, (2) ensure that water quality is maintained or restored, (3) enhance habitat conservation for species associated with the transition zone between upslope and riparian areas, and (4) provide greater connectivity within the watershed." RCAs are delineated and managed consistent with the riparian conservation objectives defined in the ROD (USDA 2004).

RCA widths vary with the RCA designation based on hydrologic properties. The designations are: (1) perennial streams; (2) seasonally flowing streams (includes ephemerals and intermittent streams with defined stream channel or evidence of scour); (3) streams in inner gorge; (4) special aquatic features (lakes, meadows, bogs, fens, wetlands, vernal pools, and springs); and (5) other hydrologic or topographic depressions without a defined channel. The SNFPA ROD (USDA 2004) defines RCA widths as follows:

Table 1: **Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision Land Allocations**

RCA Designation Type	*Width of the Riparian Conservation Area*
Perennial Streams	300 feet measured from bank full edge
Seasonal Flowing Streams	150 feet measured from bank full edge
Streams In Inner Gorge	Top of inner gorge if beyond 300 feet
Special Aquatic Features: lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs:	300 feet from edge of feature or riparian vegetation, whichever is greater (Includes Perennial Streams with Riparian Conditions extending more than 150 feet from edge of stream bank or Seasonally Flowing streams with riparian conditions extending more than 50 feet from edge of stream bank).
Other Hydrologic or Topographic Depressions	RCA width and protection measures determined through project level analysis.

Riparian Conservation Area Widths and Regulatory Requirements

The ROD (USDA 2004) defines the standard and guidelines that address the objectives of management activities when activities are allowed in RCAs. RCOs provide the objectives to be achieved in order to evaluate whether a proposed activity is consistent with the desired conditions described in the Aquatic Management Strategy (AMS). For project activities proposed within RCAs, all applicable RCOs and their associated standards and guidelines are analyzed. Under the Non-Commercial Funding Alternative (Alternative 3) the activities within RCAs would be reduced below that of the proposed action therefore analysis of the proposed action would also provide a determination that Alternative 3 meets the RCOs. Applicable objectives , the standards and guidelines and a discussion of how the proposed project actions are intended to attain the RCOs follow.

The RCA treatment acres generally follow the outer perimeter of the hydrologic feature as defined in the 2004 ROD RCA widths described above. The RCA widths are designated widths within which the RCOs must be achieved. The RCA area is the area where RCA specific magagement criteria are applied. In addition, for the Sagehen Project proposed alternatives, the management criteria for exclusion of mechanical operations was considered during project development based on the California Regional Water Quality Control Board Lahontan Region (LRWQCB) waterbody buffer zone (WBZ) widths.

Most of the mechanical operations areas that fall within RCAs are in ephemeral systems which generally align well with the WBZ widths. These areas follow the 25 foot Tractor Keep-Out

zones(TKO) requirement for theWBZ. In other areas, for example in parts of unit 213, the boundary of the unit was moved away from the perennial stream channel, and in some of these low slope areas, exceeds the WBZ requirements with only a small segment falling within the RCA buffer zone. A similar result is achieved within unit 163 around the perennial spring and Mason Fen since the unit boundary was moved away from these features. Units 68, 91,9, 98, 100, 282 and others have some hand thin and pile burn operations within the 300 foot RCA buffer of the perennial fish bearing stream.

Other proposed project actions that are relevant to RCAs include Standard Management Requirements (SMR) (4) which applies to areas within RCAs where equipment is to be limited to slopes less than or equal to 20 percent if the slope is directly above, and runs continuously down to a stream channel. If the slope is greater than 20 percent, but does not slope directly into the creek, the equipment will be limited to 30 percent slope. A map of the LRWQCB waterbody class is provided in the project record. A general comparison of those requirements versus the RCA requirements is provided in the following table. More specific definitions can be found in Attachment B of Board Order No. R6T-2009-0029 and is avialable on the state website "http://www.swrcb.ca.gov/rwqcb6/water_issues/programs/waste_discharge_requirements/timber_harvest/timberwaiver.shtml".

Table 2: Forest Service SNFPA ROD (USDA 2004) RCA widths compared to LRWQCB WBZ widths.

LRWQCB WBZ Water Resource Type	**WBZ Buffer Requirement**	**RCA Water Resource Type and Management Zone**	**Width of the Riparian Conservation Area (RCA)**	**Comments**
Class 1-Perennial Fish Bearing and Springs (up to 100 feet downstream of activity)	Slope < 30%, 75 feet Slope 30 -50%, 100 feet Slope > 50%, 150 feet	Perennial and Domestic Springs (up to 100 feet downstream) Seasonal within 100 feet of fish bearing.	Perennial and Springs 300 feet measured from riparian vegetation or bank full edge.	Most treatment areas are < 30% slope in the larger project area and few are within the 30 to 35% range.
Class II - Fish Bearing within 1,000 feet downstream of activity	Slope < 30%, 50 feet Slope 30 - 50%, 75 feet Slope > 50%, 100 feet	Seasonal flow regime (Intermittent and Ephemeral non-fish bearing) Non Domestic Springs	Seasonal flow 150 feet measured from riparian vegetation or bank full edge. Springs as described above	
Class III-waterbody capable of sediment transport to Class	Slope < 30%, 25 feet Slope ≥30%, 50 feet	Seasonal flow regime (Intermittent and Ephemeral non-fish bearing >	150 feet measured from riparian vegetation or bank full edge.	Management will exclude tracked equipment within 25 feet of channel or

LRWQCB WBZ Water Resource Type	WBZ Buffer Requirement	RCA Water Resource Type and Management Zone	Width of the Riparian Conservation Area (RCA)	Comments
I or II.		1,000 feet from fish bearing Class I and II)		riparian vegetation for slopes < 30%.
Class IV – Man made water bodies	Slope < 30%, 25 feet Slope ≥30%, 50 feet	The same as described by type in RCA table 1 above	The same as described by type in RCA table 1 above	Direction does not distinguish between manmade bodies of water.
Unclassified- no transport of sediment to higher order waterbody	Exclude activities from channel zone	SMR (4) "Do not track up and down drainage pathways and minimize all equipment movement through swales"		Uncommon, may include smaller springs and fens that dry-up downstream from feature.

All the proposed treatments in RCAs are designed to minimize disturbance of riparian vegetation, soils, and other aquatic habitat elements. Protection measures include restricting mechanical equipment use based on the waterbody buffer zones through project layout as guided by the LRWQCB (Attachment A) and as discussed above. Also mitigations such as that required by SMR (17) "Mulching will occur over bare ground created by management activities within the RCA with particular attention paid near the hydrologic feature" will help minimize erosion. In near stream zones for perennial streams and intermittent streams or seasonally wet areas with riparian and meadow features, approximately 70 percent ground cover will be required. Large patches of bare ground created by project activities will be mulched.

The contract administrators and operators will emphasize the importance of minimizing impact while working within the RCA, and will ensure protection measures for work conducted in sensitive areas will be adequate to control erosion and prevent disruption of the hydrologic function. (See Appendix A in the Sagehen Project Enivornmental Assessment (EA) for additional details about SMRs).

Analysis of Need for Peer Review of RCAs

The following direction for RCAs is identified within the 2004 ROD: "For vegetation treatments or other activities proposed within CARs (Critical Aquatic Refuges) and RCAs that are likely to significantly affect aquatic resources, a peer review process will be utilized. A project will be peer reviewed if it proposes ground-disturbing activities in more than 25 percent of the RCA or more than 15 percent of a CAR" (USDA 2004). The following discuss the elements of this direction and appliciability of the need for a peer review for the Sagehen Project proposed actions.

There are no CARs in the Sagehen Project area. The Sagehen Project does not propose "ground disturbing activities" within RCAs. "Ground disturbing activities" is defined in the ROD,

Appendix B as "activities that result in detrimental soil compaction or loss of organic matter beyond the thresholds identified in the soil quality standards." However, treatment methods including; Low ground pressure equipment (feller buncher and excavator/masticator), limited use of high ground pressure equipment (rubber tired skidders), single end suspension endlining, hand cutting and piling, mechanical piling, mastication, and prescribed fire would be utilized to treat vegetation and fuels within RCAs. The related effects presented in the Sagehen Soils Report are summarized below:

> No detrimental disturbance would exceed the standard in severity and extent for effective cover, porosity, or organic material. The Action Alternatives are not predicted to exceed the standards for the thresholds for detrimental soil compaction or loss of organic matter.

All existing roads and landings may be used during vegetation and fuels management activities. Existing roads are not considered a ground disturbing activitiy according to the TNF LRMP (USDA 1990) definition. However, temporary roads may cross through RCA areas but do not equate to 25 percent of an RCA. The Proposed Action Alternative includes approximately 3.8 miles of temporary roads with approximately 5.5 acres of disturbance over the project area. There are an estimated 0.27 miles of temporary road through RCA buffers on seasonal streams, 0.06 miles in perennial RCA and 0.26 miles in meadow fen or spring RCAs, resulting in less than 25 percent of ground disturbing activities in the RCA. Additionally at the end of project use, these roads would be subsoiled and obliterated, and mulch and organic matter would be re-incorporated onto the surface soils. There are no proposed temporary roads in RCAs in Alternatives 2 or 3. The Sagehen Project under all alternatives would not exceed the 25 percent threshold for proposed ground-disturbing activities in the RCAs, and therefore, peer review is not required.

Sagehen Project Emphasis Areas

The Proposed Action Alternative has divided treatment unit objectives based on landscape position and marten habitat characteristics. This section presents a synopsis of the emphasis areas developed under this proposed action.

Emphasis area 1 (green areas on Map 1, EA) represents some of the high quality marten habitat currently existing on north facing slopes, ridges, on higher elevation south facing slopes and on lower elevation south facing slopes. Emphasis area 1 is prescribed to maintain relatively higher basal areas of larger trees, as compared other emphasis areas and retains/recruits the highest number of snags, short snags/high stumps, and existing Dense Cover Areas (DCAs). Fuels treatment objectives focus on ladder fuel removal. Emphasis area 1 is designed to maintain reasonable connectivity for wildlife by providing cover from predators. Parts of proposed action units 33, 35, 38, 61, 98, 99, 100, 156, 163, and 213 contain emphasis area 1.

Emphasis areas 2 (blue areas on Map 1, EA) and 4 (fuchsia areas on Map 1, EA) include the drainage bottoms. Emphasis area 2 is dominated by greater than 11 inches diameter breast height lodgepole pine and an average crown cover of 40 percent or more. Emphasis area 4 can include perennial and intermittent streams, as well as mesic and relatively xeric ephemeral drainages that provide relatively high canopy closures within the treed areas, but would also allow enough light for well-developed herbaceous ground cover where sufficient water exists.

Relatively more mesic conditions would have more downed logs and high stumps and would be composed of more lodgepole pine; while more xeric conditions would have lower amount of the desired elements including; dead wood components; basal area retention, crown cover, snag, down wood, and short snag densities, percentage in DCAs and/or Early Seral Openings (ESOs). Fuel objectives address ladder fuel and horizontally break up continuous fuel beds. Most proposed action units contain some emphasis area 2 or 4 including units 33, 35, 36, 38, 46, 61, 73, 76, 89, 91, 98, 99, 100, 213, and 282.

Emphasis area 5 (gray areas on Map 1, EA) include the north facing slopes. The area objective is to work towards stand level ecological restoration. In the plantations, focus is on the first steps of achieving a resilient heterogeneous forest by retaining some young porcupine damaged trees and other defects suitable for nesting/resting structures, and retaining residual or legacy trees. In areas outside of plantations, objectives include retaining individual trees, small groups of trees, retaining existing DCAs, and creating ESOs. Emphasis area 5 supports lower basal area and crown cover than drainages or emphasis area 1. Overall treatment objectives for basal area, crown cover, snags, down wood, short snags, and DCAs would retain components of existing features, or in plantations, facilitates the creation of, important habitat structures to move the habitat towards suitability for old forest species. Fuels treatment includes ladder fuel removal over portions of the unit and to horizontally break up continuous fuel beds. Proposed action units containing emphasis area 5 include 33, 34, 35, 36, 38, 39, 46, 47, 73, 76, 85, 87, 98, 99, 100, 163, and 213.

In emphasis areas 6 and 7 (orange and yellow areas on Map 1, EA), the priority objective is for fuels reduction. Basal area and crown cover would be lower than in emphasis areas 1-5. In emphasis area 6, the basal area objective is to help increase tree growth. Basal area is retained in larger individual trees, small groups of trees, and DCAs. ESOs that can support younger cohorts of a variety of species are created. A secondary emphasis includes retaining some young porcupine damaged trees and other defects suitable for nesting/resting structures, retaining residual or legacy trees and areas that are sparsely treed. In plantations, these areas would become similar features to DCAs and ESOs. Enough basal area, crown cover, and habitat components such as snags, down wood, and existing DCAs would be retained to allow marten movement in and through these emphasis areas. Proposed action units containing emphasis areas 6 or 7 include 33, 34, 35, 36, 38, 46, 73, 76, 85, 87, 89, 90, 99, 100, 163, 213, and 282.

Emphasis area 8 (purple areas on Map 1, EA) goal is stand level ecological restoration of aspen stands by minimizing direct conifer competition. Proposed action units containing emphasis area 8 include 80 and 85.

See the Sagehen Project EA for a full description of the project alternatives. In summary, the Proposed Action Alternative proposes multiple vegetation and fuels treatment activities on 2,654 acres, Alternative 2 is the No Action Alternative, and the Non-Commerical Funding Alternative, Alternative 3 proposes fuels treatments on 1,131 acres.

Saghen Project RCA Summary

For the proposed action, the RCA areas proposed to be treated under the Sagehen Project are presented by emphasis area for each category in the attached Table 3 and Table 5 *RCA by Emphasis Area*. These tables are presented on a project area basis and displays totals based on

mechanically treated and manually treated RCA acres by action alternatives for Alternative 1 and Alternative 3 respectively. Tables 4 and 6 display information based on location by watershed for the Hydrologic Unit Code (HUC) level 7 analyses area and emphasis area by action alternatives for Alternative 1 and Alternative 3 respectively. This summary may differ from information presented in the project's aquatic wildlife biological evaluation/biological assessment due to differing analysis areas and objectives.

This document describes the RCA by project area analysis presented in the following paragraph and is followed by analysis based on three HUC 7 drainage areas analyzed for the; Upper Sagehen Drainage area, Lower Sagehen Drainage area, and Saddle Meadow Drainage area. No areas of RCA treatment are proposed within the Prosser Creek Drainage area. In addition, no RCA treatment is proposed in the Saddle Meadow Drainage area under Alternative 3.

It should be noted that the special aquatic features RCA management zones can be overestimated as the feature is often included in the buffer due to GIS processing methods and complex overlap of RCA features. In the case of meadows the feature may be included in the buffer acres, thus over estimating the acres treated within the RCAs. Meadows can account for significant acreage as they can be relatively spatially large. When defining the acres by activity area, for some cases the meadow feature is excluded from the activity area polygon, and in operationally difficult cases, the special aquatic feature is included in the acres. A hierarchy of RCA features is applied when determining the total acres of RCA. Based on importance, perennial buffers are usually emphasized over other features. This method avoids double counting RCA buffers from buffers that overlap due to nearby features. The hierarchy used is available in the project record.

The following summarize the proposed actions within the RCA area under Alternative 1 described as approximately 96.2 acres (4.9 mechanical) in perennial management zones, approximately 338.9 acres (263.2 mechanical) in seasonal management zones and 229.5 acres (159.3 acres mechanical) in Special Aquatic Feature (meadow, fen and spring) management zones.

The following summarize the proposed actions within the RCA area under Alternative 3 described as approximately 88.7 acres (1.6 mechanical) in perennial management zones and 134.9 acres (71.3mechanical) in seasonal management zones and 124.8 acres (55.1 acres mechanical) in Special Aquatic Feature (meadow, fen and spring) management zones.

The RCA summary is described by drainage area for the HUC 7 analysis area. Table 3 and Table 5 at the end of this document presents the information for buffer zones treated by activity for each of the emphasis areas in each drainage analysis area for the Proposed Action Alternatives 1 and Alternative 3. The acres by RCA for each drainage area are summarized below and the overall percentage of RCA treated by type is provided for the Proposed Action Alternative and Alternative 3.

Within the Upper Sagehen Drainage area under Alternative 1, there are a total of 40.9 acres of RCA treatment along the margins of perennial RCA management zones (13 percent of perennial RCA treated in the project area drainages). There are 187.4 acres of treatment along the margins of special aquatic features (33 percent of special aquatic features RCA in the project area drainages). See previous discussion of RCA estimation for special aquatic features. There are 169.6 acres of seasonal RCA management zones treated in the Upper Sagehen drainage (14

percent of the seasonal RCA in the project area drainages).

Within the Lower Sagehen drainage under Alternative 1, there are a total of 55.3 acres of RCA treatment along the margins of perennial RCA management zones (19 percent of perennial RCA treated in the project area drainages). There are 41.9 acres of treatment along the margins of special aquatic features (22 percent of special aquatic features RCA treated in the project area drainages). There are 112.2 acres of seasonal RCA management zones treated in the Lower Sagehen project area drainages (19 percent of the seasonal RCA in the project area drainages).

When actions are assessed by watershed there are no proposed activities within RCAs in the Prosser Creek drainage. Within the Saddle Meadow drainage under Alternative 1, 57.8 seasonal RCA acres will be treated (approximately 5.5 percent of the seasonal RCA features in the drainage).

The following summarize the proposed actions within the RCA area under Alternative 3 described as approximately 82.9 acres (1.6 mechanical) in perennial management zones and 134.9 acres (71.3 mechanical) in seasonal management zones and 124.8 acres (55.1 acres mechanical) in Special Aquatic Feature (meadow, fen and spring) management zones.

Within the Upper Sagehen drainage under Alternative 3, there are a total of 33.4 acres of RCA treatment along the margins of perennial RCA management zones (11percent of perennial RCA treated in the drainage). There are 82.8 acres of treatment along the margins of special aquatic features (15 percent of special aquatic features RCA in the drainage). See previous discussion of RCA estimation for special aquatic features. There are 45 acres of seasonal RCA management zones treated in the Upper Sagehen drainage (4 percent of the seasonal RCA in the drainage).

Within the Lower Sagehen drainage under Alternative 3, there are a total of 55.3 acres of RCA treatment along the margins of perennial RCA management zones (19 percent of perennial RCA treated in the project area drainages). There are 41.9 acres of treatment along the margins of special aquatic features (22 percent of special aquatic features RCA treated in the project area drainages). There are 89.7 acres of seasonal RCA management zones treated in the Lower Sagehen drainage (15 percent of the seasonal RCA in the project area drainages).

When actions are assessed by watershed there are no proposed activities within RCAs in the Prosser Creek Drainage area or within the Saddle Meadow Drainage area under Alternative 3.

RIPARIAN CONSERVATION OBJECTIVE #1: *Ensure that identified beneficial uses for the waterbody are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses. (RCO #1 is linked to the following AMS goals: #1: Water Quality; #2: Species Viability; #7: Watershed Condition)*

The Water Quality Control Plan for the Lahontan Region, California Regional Water Quality Control Board Lahontan Region (LRWQCB, 2000), define the beneficial uses for the Middle and the Little Truckee River drainages, and provide direction applicable to the project drainages as follows:

- Municipal and domestic water supplies
- Irrigation and water supply for agriculture
- Groundwater recharge, contact and non-contact recreation
- Commercial and sportfishing
- Cold freshwater fisheries and spawning habitat
- Wildlife habitat, rare, threatened or endangered species habitat
- The beneficial uses of the Truckee River drainage include the migration of aquatic organisms.

The water quality objectives for beneficial uses that could potentially be affected by the Sagehen Project include sediment, temperature and turbidity, also to a lesser degree pesticides (Boron) and controlled use of petroleum based products. A summary of the Best Management Practices (BMPs) and management requirements used to protect watershed resources can be found in the Sagehen Project Environmental Assessment, *Standard Management Requirements (SMRs)*, Appendix A, and include Best Management Practices (BMP) designed to protect the beneficial uses of water.

The California Regional Water Quality Control Board (LRWQCB, 2000) for the Lahontan Region sets water quality standards and objectives for these watersheds. The State and Regional Boards entered into an agreement with the U.S. Forest Service (USFS) which requires the agency to control non-point source discharges by implementing the measures certified by the State Board as Best Management Practices (BMPs). BMPs are incorporated into the SMRs and are designed to protect water quality.

Standards and Guidelines Associated with RCO #1:

95. *For waters designated as "Water Quality Limited" (Clean Water Act Section 303(d)), participate in the development of Total Maximum Daily Loads (TMDLs) and TMDL Implementation Plans. Execute applicable elements of completed TMDL Implementation Plans.*

Sagehen Creek drainage proper and the Little Truckee River within the Saddle Meadow Drainage area are tributaries to the Little Truckee River, which is a tributary to the Middle Truckee River, listed as 303 D, impaired waters for sediment. A small region of activities near the crest of the divide are also proposed to be conducted in the upper boundaries of Prosser Creek also part of the Middle Truckee River, but there are no treatments within the RCA. All of these drainages discharge to reservoirs prior to being released to the Truckee River and therefore, would not affect sediment in the Middle Truckee River. This project area description and the relationship to the surrounding landscape can be found in the Sagehen Project Hydrology Report which also contains information on the proposed actions within tributaries to "Water Quality Limited" waters. The TMDL for the Middle Truckee River relies on the Management Agency Agreement between the State Water Board and USFS, which requires the USFS to implement the practices and procedures outlined in the Water Quality Management Agency Agreement for National Forest System (NFS) land in California.

The US Forest Service will identify, implement, maintain, and monitor BMPs to protect water quality. The strategy is to identify problem areas (related to sedimentation and erosion) on NFS lands and to track and report progress on TMDL targets for dirt road maintenance and legacy site

restoration over the next 20 year period. Through this process projects have been identified and prioritized for implementation to control sediment delivery from NFS lands and regular reporting requirements are completed based on implementation and effectiveness monitoring.

The Tahoe National Forest outlined the proposed actions specific to the TMDL in an April 25, 2011 letter to the LRWQCB. This letter identifies the future road and trail improvements that will be implemented to meet requirements of the TMDL. In conjunction with that proposal, a survey was conducted in the Sagehen Project and adjacent areas using the Soil & Water Roads Condition Inventory (SWRCI) protocol which rates road segments as functional, at-risk, or impaired and aids in identifying problem areas. Future improvements include adding dips and drainage features to the existing roads where problems were identified. Funding sources have been and continue to be solicited and progress made to achieve these objectives. Segments tied to proposed actions would be included for maintenance activities and potential future funding for road improvements.

A total of 15.8 miles of Forest Service maintained roads in the Upper Sagehen Basin (HUC 7) were surveyed. Of the survey miles, 6.5 miles were considered to be at risk with 1.7 miles rated as impaired. In the Lower Sagehen Basin, 13.6 miles of Forest Service maintained roads were surveyed, and 8.6 miles were rated at risk and 2.3 miles were rated as impaired. This road survey includes county roads, and roads that are not accounted for within the watershed analysis as there is no relationship of some of these roads to the proposed action. For the most part, the roads rated as at-risk are in need of maintenance, while those rated as impaired may need design improvements or modifications to attain objectives. Maintenance of haul roads will improve some roads that overlap problem areas rated as at risk or impaired and identified through the Soil & Water Roads Condition Inventory (SWRCI) inventory. These areas of overlap are covered within the Sagehen Project Hydrology Report.

The Tahoe National Forest would submit an application for a conditional waiver of waste discharge according to the California Regional Water Quality Control Board, Resolution No. R6T-2009-0029 (Lahontan Regional Board) as amended, for actions implemented under the Sagehen Project. Receipt of and compliance with the terms of the waiver under Order Number R6T-2009-0029 includes monitoring requirements, reporting, and an action plan as the means used to ensure environmental compliance.

All the proposed treatments in RCAs are designed to minimize disturbance of riparian vegetation, soils, and other aquatic habitat elements. Protection measures include restricting mechanical equipment use considering the waterbody buffer zones as defined by the California Water Quality Control Board (LRWQCB) Lahontan Region (Attachment A of that document). Mulching would be provided over any bare ground created within the RCA. Out of 664.6 acres of RCA treatment in Alternative 1, approximately 64 percent of the acres (427.4 acres) would be treated under manual means and will be followed up with a pile burn or underburn fuels prescription. Best Management Practices Evaluation Program monitoring on the forest has shown prescribed underburning meets the ground cover requirements under more than 90 percent of the monitored cases to provide successful erosion control. Mechanical treatment areas will follow guidelines set out under the SMR requirements and the equipment exclusion areas as described in the supporting Sagehen Project documents.

96. *Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages.*

Most of the seasonal drainages within the Sagehen Project area are ephemeral and because these habitats are ephemeral they do not contain water long enough for shade and stream temperature to affect the aquatic resources when stream temperatures are limiting. Perennial springs and streams are heavily influenced by groundwater and there is a continued flux of inputs from these sources from various locations in the basin. Within the analysis area, shade and temperature are important habitat elements along perennial streams. The proposed action, Alternative 1, is not expected to significantly adversely affect water temperatures due to the proposed prescription for canopy retention.

The management prescriptions for Emphasis Areas 2 and 4 are designated based on the low lying topography that commonly transports water. Management activities within the Sagehen Project area are designed to maintain the canopy cover at levels that provide shading. Canopy levels in Emphasis Area 2 are identified as ranging from 55 to 64 percent (51.4 acres perennial RCA with all manually treated). The canopy levels in Emphasis Area 4 for the proposed action are identified as ranging from 50 percent to 65 percent canopy cover (17.7 acres perennial RCA, with 0.4 acres mechanically treated). The canopy levels in Emphasis Area 6 are identified as ranging from 50 percent to 65 percent canopy cover (2.5 acres perennial RCA, with 2 acres mechanically treated). The canopy levels in Emphasis Area 8 has the objective to enhance aspen sucker success and includes primarily removal of understory and trees removable through manual felling which usually occurs up to 14 inches diameter breast height. These areas include 4.2 acres of perennial stream as manual treatment).

Furthermore, the potential for a change in water temperature from proposed activities is low. Because the areas surrounding perennial systems (RCAs) will not be affected by a significant change in canopy cover in the near stream zone (150 feet), there will not be a measurable effect on the thermal regime. This is primarily due to method of treatments used within the RCAs around perennial features, and is also tied to the emphasis area requirements for canopy retention as described in **Sagehen Project Emphasis Areas** above.

For instance in the Upper Sagehen Drainage area, the majority of treated perennial acres are manual treatments (91.3 acres) primarily in units 61, 80, 91, 98, 99, 100 and 282 surrounding Sagehen Creek. The project objectives are designed to reduce ladder fuels, but it is not designed to significantly reduce vegetative over story. In unit 282 the fuels prescription includes proposed underburning (21.7 acres) and this could reduce some canopy cover in small locations, but is not expected to significantly reduce canopy near the stream channel due to prescribed burn limitations. Fuel moisture is maintained to meet ignition criteria described in the burn plans that are designed to allow controlled fire condtions. The SMRs such as no active ignitions within 25 feet of riparian vegetation (SMR 18) and other means of reducing fuels prior to underburning can limit burn severity. Since unit 282 is adjacent to the University of California Berkeley Sagehen Experimental Station and Sagehen Creek campground these areas are important for fuel reduction for fire prevention and emergency ingress and egress. Other perennial RCA treatment areas in the Upper Sagehen Drainage area are small and scattered across units. Similarly, within the Lower Sagehen Basin, primarily in emphasis areas 2 and 4 (drainage bottoms) Unit 100 and Unit 98 have proposed hand thinning and underburn treatment (approximately 26.5 acres and 15.2 acres respectively).

In emphasis area 1 (north facing slopes, ridges, higer and lower elevation south facing slopes), many of the mechanical treatment areas are located out of the perennial RCAs. There are 0.4 acres proposed perenial mechanical treatments within the Upper Sagehen Drainage area, zero mechanical treatment acres in perenial RCAs in the Lower Sagehen Drainage area and no mechanical acres in perennial RCAs in Saddle Meadow. Similarly for mechanical treatments in emphaisis area 5 there are 0.5 proposed mechanical treatment acres in the perennial RCA within the Upper Sagehen Drainage area, 1.6 mechanical treatment acres in the perennial RCA within the Lower Sagehen Drainage area and no mechanical treatment acres in perennial drainage RCAs in the Saddle Meadow Drainage area. Thus, the majority of perennial RCA areas are limited to fuels treatments and are not expected to significantly affect canopy closure of the overstory as described previously.

Similarly, along special aquatic features (mesic or wet systems such as meadows, springs and fens) the margins of the RCA buffer for the feature would be treated. Units 213 and 46 surround meadows and contain areas with springs. Unit 213 will treat 24.6 acres at the outer margins of these features and includes mechanically thinning, grapple piling and pile burning. In unit 46 the plantation will be mechanically thinned and masticated, over 51.6 acres surrounding special aquatic features, and underburning fuels prescription treatment would occur in the RCA marginsover 31.6 acres. Even though the whole meadow feature is included in the underburn unit, the more mesic features within this boundary are expected to remain unburned. The management requirement (SMR18 and 41) is to only allow a backing fire and therefore much of the wet and meadow systems in this unit are expected to remain unburned due to the mesic conditions of the site. The perennial segments, fens and springs would remain largely unburned except for the drier margins leading to the wet feature and existing canopy near the perennial feature would be retained.

The small acres of treatment is designed to retain much of the existing overstory canopy so, no significant change to the thermal regulation of the adjacent perennial and intermittent stream channels are expected. Emphasis Areas 6 and 8 have small acres with proposed treatment areas along perennial streams.

No changes to temperature would be expected due to treatment in seasonal drainages as these areas are not typically contributing to flow during the season where water temperatures are limiting. There are a total of 4.9 mechanical treated acres in perennial RCA systems. No adverse effects to water temperature are expected to be influenced by changes in canopy under Alternative 1.

The primary difference between Alternative 3 and the proposed action alternative is that fewer acres of RCA would be treated (348.4 acres) and most of this would be treated manually (226.4 acres). The suppressed cut for hand treatment proposes to remove the majority of trees less than ten inches dbh in the units proposed for treatment. There would be no designed DCA or ESO treatment areas and the areas treated by hand focus on removal of smaller ladder fuels and usually do not largely affect overstory canopy. The trees removed are focused on 12 inches and smaller dbh with a minor component limited to 18 inches that would occur in mechanically treated mastication units. There are a total of 128 RCA acres proposed to be treated by mastication. The majority of these acres lie in plantations that currently are lacking in large diameter trees around the seasonal RCAs. Little change in the existing overstory canopy that

would affect water temperature is likely to result under this proposed action as the perennial systems are limited to 1.6 acres of mechanical treatment.

97. *Limit pesticide applications to cases where project level analysis indicates that pesticide applications are consistent with riparian objectives. Prohibit application of pesticides to livestock in RCAs.* Note: Livestock requirement is not applicable to this proposed action.

Pesticides; the proposed action includes treating cut stumps with Sporax® to reduce the spread of the root disease *Heterobasidion annosum*. The primary constituent in Sporax® is the inorganic trace element Boron. Boron is widely found in nature. The management actions to be taken to achieve compliance are included in the Sagehen Project Environmental Assessment, Appendix A, referred to as SMR (13).

Levels of boron present would meet the anti-degradation policies, the use of Sporax® will not result in concentrations in bottom sediments or aquatic life that adversely affect beneficial uses, will not exceed the lowest levels technically and economically achievable, nor will the maximum contaminate limits for boron be exceeded. The application of Sporax® will follow management requirements, identified under SMR (13) and covers BMP 5-8, 5-10 and 5-12 for boron, which will ensure beneficial use is protected. Careful application methods, a 25 foot buffer application distance from surface water, and a spill plan are the primary means for meeting the water quality objectives for pesticides. The amount of boron added through the proposed action would be unlikely to exceed the range of natural variation of boron associated with normal occurrence in the environment (SERA, 2006).

The Water Quality Control Board for the Lahontan Region has outlined water quality objectives for boron at specific locations including the Truckee River at the Stateline (1.0 mg/l). The locations where Boron objectives are applicable are a great distance from the proposed Sagehen Project. The limits for boron, as designated for specific locations by the LRWQCB would not be affected by the proposed project. The proposed action would meet water quality objectives, and thereby ensure protection of beneficial uses of the state's waters for pesticides used under this proposed action.

98. *Avoid pesticide applications within 500 feet of known occupied sites for the California red-legged frog, Cascade frog, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and northern leopard frog unless environmental analysis documents that pesticides are needed to restore or enhance habitat for these amphibian species.*

Mountain yellow-legged frogs have been documented within the Sagehen Basin. Population and breeding sites are unknown, since only occassional individuals have been documented. Individuals have been sighted in areas associated with unit 61(Emphasis areas 1 &2), unit 91 (Emphasis area 2), and unit 213 (Emphasis areas 1, 2, 4, & 6). Units 61 & 91 are proposed for hand treatment. Hand treatment units will cut trees 14 inches dbh or less, and Sporax® would not be applied to stumps. Unit 213 has the potential to cut trees greater than 14 inches dbh, therefore Sporax® may be applied. SMR 31 requires that an Aquatics biologist review areas within 500ft of occupied sites of mountain yellow-legged frogs post treatment to determine if application of Sporax® should be avoided.

99. *Prohibit storage of fuels and other toxic materials within RCAs except at designated administrative sites and sites covered by a Special Use Authorization. Prohibit refueling within RCAs unless there are no other alternatives. Ensure that spill plans are reviewed and up-to-date.*

Controlled Use of petroleum products is addressed through proper application of the measures in BMPs 2-11 and 7-4 which provides measures for protecting water resources from spills. This BMP is covered under Appendix A, SMR (15) in regard to the managing of petroleum products to protect beneficial uses. The management actions to be taken include requirements for servicing and refueling equipment to be performed outside of RCAs as well as implementation of a spill contingency plan. Proper planning and implementation of these practices provide measures to protect water quality and beneficial uses from contamination by fuels and toxic materials.

RIPARIAN CONSERVATION OBJECTIVE #2*: Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species. (RCO #2 is linked to the following AMS goals: #2: Species Viability; #3: Plant and Animal Community Diversity; #4: Species Habitats; #5: Watershed Connectivity; #6: Floodplains and Water Tables; #8: Streamflow Patterns and Sediment Regimes; #9: Streambanks and Shorelines)*

Standards and Guidelines Associated with RCO #2:

100. *Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.*

The Sagehen Project provides 2 specific actions to improve existing conditions and provides measures to maintain the geomorphic and biological characteristics of special aquatic features.

Special measures and treatment prescription surrounding fens along the boundary of units 85/87 also includes the restoration of Road 11-5 Actions 1 and 2 of the proposed action description. Under Action 1 road obliteration is proposed and would consist of re-contouring the roadbed over 0.9 miles to a hydrologically neutral state. Action 1 also includes emphasizing protection and neutral landscape configuration above fens, designing drainage to match natural patterns, reducing compaction (sub-soiling), blocking the closed portions from future access, and mulching or otherwise providing slash and soil organic matter to control erosion.

Under the proposed action for Road 11-5 described above, approximately 300 feet of this road which currently crosses through a fen and aspen stand, would be removed. Restoration actions would be designed to restore hydrologic function and maintain biological characteristics by removing the existing culvert that currently accelerates drainage from the fen and restoring the adjacent downslope landscape reconnecting drainage across the restored roadbed which bisects the fen. It is estimated that in combination with the aspen treatment (conifer removal), the fen

and wetland hydrology in the area surrounding the fen could be improved over approximately three acres under Alternative 1. Alternative 3 does not include these restoration activities; therefore the improved hydrology on three acres would not be realized.

Additional measures for protection include specific burn prescription requirements when burning near aquatic features such as BMPs covered under Appendix A, SMR (18). By design the treatment area around the fen and wetland features and use of mechanical equipment is minimized. In unit 163, above the Mason Fen, special measures were taken to exclude moist areas that are hydrologically connected to the fen. Measures also include special fuels treatment along the unit boundary to minimize fire consumption levels as fire moves toward the fen. In unit 98, the no treatment buffer around the fen is increased by an additional 25 feet of no treatment area to protect a unique botanical species that is associated with that fen.

101. *Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species. Locate water- drafting sites to avoid adverse effects to in stream flows and depletion of pool habitat. Where possible, maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows, wetlands, and other special aquatic features.*

Aquatic organism passage (AOP) surveys were conducted throughout the Sagehen Basin in September of 2010. Nineteen crossings were evaluated, of which four sites had the AOP protocol applied. Of these four sites, three were determined to be inadequate, and one indeterminate. Field notes indicate that many of the existing culverts that are associated with meadow habitat and tributaries are blocked with debris or are potentially barriers to aquatic organisms. The Sagehen Project does not propose any new crossings that would hinder aquatic passage, or alter existing stream crossing. Water drafting sites would be pre-determined and approved by either an Aquatics Biologist or Hydrologist prior to use (SMR 14). Water drafting sites will be established on permanently flowing streams that have sufficient flow to avoid depletion of pool habitat. SMR 14 requires that water drafting would halt if stream flows are less than 2 cfs, where drafting would then occur at established off site water impoundments. As described under RCO #2, the Sagehen Projects SMRs and BMPs are designed to maintain the function of RCAs, therefore, meadows, wetlands, and other special aquatic features are not expected to have measurable change.

As described under Standard and Guideline 100 above, two restoration actions are proposed in association with existing conditions and existing roads to restore water table elevation in special aquatic features by improving hydrologic connectivity under Alternative 1.

102. *Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs.*

While the project identified mechanical treatment within RCAs, the larger extent of the proposed treatment in the near stream zone is primarily limited to seasonal streams. Tables 3, 4, 5 and 6 at the end of this document provide a summary of the proposed action alternatives and proposed

activities in the RCA. A couple of treatment areas surrounding wetlands and fens are designed to improve associated aspen and riparian expansion. Trees retained within the riparian buffer include bank stability trees and the proposed prescription provides for future woody debris recruitment important for sediment routing, flow deflectors and habitat structure. While woody debris is considered to be on average in a smaller size class than would be observed pre-logging period (pre 1870) (lacking in large trees over 30") and particularly lacking in extent in many seasonal drainage locations within the watershed, the proposed action will provide stand heterogeneity and should improve the a larger range of future size class and a regenerating supply of future wood recruitments. For those areas lacking in downed wood and where there are available sources SMR (39) will be implemented to supplement downed wood for channel geomorphic purposes.

103. *Prevent disturbance to meadow-associated streambanks and natural lake and pond shorelines caused by resource activities from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines.*

To prevent disturbance to meadow-associated streambanks and natural ponds, the SMRs have established management objectives within the RCA and boundaries designated as Tractor Keep Out (TKO) for equipment exclusion. These TKO boundaries are guided by the Waterbody Buffer Zones (WBZ) as described in the California Water Quality Control Board, Lahontan Region. Additionally, the LRWQCB waiver requirements were considered when developing the BMPs and were incorporated into Appendix A, SMR (19, 22, 23 and 24) have been included and are designed to meet requirements of the Lahontan Region WQCB waiver requirements. Equipment limitations were applied to units surrounding meadows and natural ponds. Within units 213, 46 and others the project was designed to exclude sensitive stream channels and natural pond shorelines as described in S&G 96 above under RCO#1. Disturbance is prevented by controlling the number of skid trail crossings over ephemeral drainages and repair of any damage to the streambank when removing approved constructed crossings for skid trails or temporary roads as described in SMRs (7 and 21).

105. *At either the landscape or project-scale, determine if the age class, structural diversity, composition, and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.*

Riparian vegetation within the project area would have minimal impact from management activities. Specific measures to minimize impacts to riparian vegetation include: designated areas with no ground-based vegetation management activities and buffers from direct ignition for fuels management within the perennial and intermittent riparian buffers, near fens, springs, meadows or wetlands. The Sagehen Project does not propose any vegetation or fuels activities that would affect the existing geomorphic characteristics of the perennial and seasonal streams within the project area.

Under Alternative 1, three aspen stands are being treated (through conifer removal) to improve aspen cohort viability and to improve the natural range of variability for aspen in these stands. One acre will be treated mechanically and 5 acres will be treated manually. These are small

areas that are designed to enhance the vegetative aspen community.

All remaining Standard and Guidelines associated with RCO #2 are not applicable to this project.

RIPARIAN CONSERVATION OBJECTIVE #3*: Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA. (RCO #3 is linked to the following AMS goals: #2: Species Viability; #3: Plant and Animal Community Diversity)*

Standards and Guidelines Associated with RCO #3:

108. *Determine if the level of coarse large woody debris (CWD) is within the range of natural variability in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. Ensure proposed management activities move conditions toward the range of natural variability.*

Portions of many of the perennial and intermittent streams are not within the range of natural conditions in terms of frequency and distribution of CWD due to past timber removal activities or wildfire. The Sagehen Project does not propose vegetation or fuels activities that would adversely impact existing conditions of CWD associated with stream channel physical complexity and stability; in fact the project is designed to implement practices that would replicate general landscape patterns found across lower elevations and move conditions toward the range of natural variability. Information on existing condition can be found in the Aquatics Biological Assessment/Biological Evaluation.

The application of components of the GTR 220 in Alternative 1are designed to simulate fire regime conditions under which the eastern pine and mixed conifer forests developed; therefore, moving the system toward the natural range of variability as defined by current science. This process is applied based on landscape position. Emphasis areas 2 and 4 have identified these pockets of lower elevation or drainages that are important sinks of cool air and moisture (Underwood 2010). These locations have higher canopy cover, fuel moistures, and more snags and logs than the surrounding forest, thereby providing contrasting forest microclimate and wildlife habitat with the surrounding upland forest (North et al. 2009). The proposed action has incorporated these characteristics into site specific design for the activity areas associated with emphasis areas 2 and 4. Emphasis area 8 is associated with aspen restoration, and in these sites the objective in this emphasis area is to minimize direct conifer competition to existing aspens and to remove conifers to the extent that the aspen stand could expand based on site conditions. As the extent of this area is small 6 acres, with 5 acres limited in the size of tree that would be treated by hand, the results are not expected to significantly affect availability of CWD. Aspen have a higher turnover rate and are also expected to contribute to the level of CWD associated with the stream and flood plain. The Sagehen Project is designed to ensure a renewable supply of large down logs by prescriptions in the proposed action that will leave adequate basal area. Within emphasis area 2 the remaining basal area for various units would vary from 160 to 200, or have no effect on existing condition. Within emphasis area 4, between 160 and 165 basal area is estimated to be retained, or have no effect. Within emphasis area 5 between 130 to 145 average basal area is estimated to be retained. The proposed prescription is expected to provide an adequate volume of logs and with the proposed Early Seral Openings (ESOs) and Dense

Cover Areas (DCAs) will provide suitable habitat within the RCA and a renewable supply of downed logs adjacent to the riparian features. Direct ignition during prescribed fire activities would not occur within 25 feet of the floodplain or riparian vegetation or within 50 feet of fens as described in Appendix A, SMR (18, and 42).

Geomorphic features are maintained by limiting tracked equipment operations to areas that would not contribute to changes in hydrologic characteristics. Woody debris is a component of geomorphic stability for streams and support riparian habitat. Tree retention for future recruitment as woody debris is provided in the prescription for the proposed project. The basal area prescription by emphasis areas range from 20 percent reduction in emphasis area 1 subunits and at the higher end 25 percent reduction in emphasis area 7 subunits.

The variability created by location of DCA (dense cover areas) and ESO (Early Seral Openings) should aid in providing habitat for plant and animal diversity within RCAs and surrounding aquatic habitats. For example, some DCAs are planned around small fens in units 46, 85, and 98. Limitations on equipment have considered the waterbody buffer zones as defined by the California Water Quality Control Board (LRWQCB) Lahontan Region (Attachment A) and as described in S&G 96 above and under the **Riparian Conservation Area Widths and Regulatory Requirements** discussion at the beginning of this analysis.

Trees in the near channel zone would be retained at adequate levels to provide for future wood recruitment. The surrounding forest stand would create better transitional conditions between the upland of the RCA and the immediate adjacent area of the hydrologic feature (e.g. stream, fen, meadow). Both vertical and structural diversity and an early seral stage would be represented. Shade along perennial streams would also be supported through the prescriptive design (S&G 96, RMO #1).

The primary difference between Alternative 3 and the proposed action alternative is that fewer acres of RCA would be treated (348.4 acres) and most of this would be treated manually (220.4 acres). The suppressed cut proposes to remove the majority of trees less than ten inches dbh within the units proposed for hand treatment. There would be no designed DCA or ESO treatment and no different treatment designation as emphasis areas. The tree size to be removed is focused on a 12 inch dbh or smaller with occasional trees of 18 inches dbh removed in the plantation thinning units. The average canopy would be higher than under Alternative 1 with a range of 59 to 66 percent average weighted canopy cover. A total of 128 RCA acres would be manually treated. The majority of these acres lie in plantations that currently are lacking in large wood. Adequate numbers of trees are made available to reach the channel with an average spacing of 14 to 22 feet distance as the designed prescription under this action alternative. Treatment of perennial systems RCA are limited to 1.6 acres of mechanical treatment.

All remaining Standard and Guidelines associated with RCO #3 are not applicable to this project.

RIPARIAN CONSERVATION OBJECTIVE #4*: Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species. (RCO #4 is linked to the following AMS goals: #2: Species Viability; #7: Watershed Condition)*

Protection measures are provided for areas on the landscape susceptible to impacts from ground-based equipment. The areas that have the greatest sensitivity to ground-based equipment are areas adjacent to riparian habitats (RCAs), areas with seasonal high-water tables, and areas with slopes generally over 30 percent slopes. Equipment restrictions are presented in Appendix A SMR (4 and 23).

Additional measures for protection include specific burn prescription requirements when burning near aquatic features such as fuels BMPs 6.2 and 6.3 covered under Appendix A SMR (17, 18, 42 and 46). By design the treatment area around the fen and wetland features and use of mechanical equipment is minimized. All proposed actions are designed to minimize impacts to aquatic- and riparian-dependent resources.

Standards and Guidelines Associated with RCO #4:

110. *Use screening devices for water drafting pumps. Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats.*

BMP 2.21 Water Source Development Consistent with Water Quality Protection is included in the Appendix A SMR (14) and is designed to minimize streamflow fluctuation, maintain water quality, and protect fish habitat by minimizing inadvertent removal of aquatic species from aquatic habitats.

111. *Design prescribed fire treatments to minimize disturbance of ground cover and riparian vegetation in RCAs. In burn plans for project areas that include, or are adjacent to RCAs, identify mitigation measures to minimize the spread of fire into riparian vegetation. In determining which mitigation measures to adopt, weigh the potential harm of mitigation measures, for example fire lines, against the risks and benefits of prescribed fire entering riparian vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could be damaging to habitat or long-term function of the riparian community.*

Prescribed fuels treatments in RCAs within the Sagehen Project area include grapple piling and burning of vegetation and dead surface fuels; and mastication. All mechanical equipment is required to follow the same guidelines in RCAs. All prescribed fire treatments within RCAs will follow guidelines presented and described in the SMRs. These guidelines are intended to minimize disturbance of ground cover and riparian vegetation in RCAs and to minimize the spread of fire into riparian vegetation.

112. *Post-wildfire management activities in RCAs should emphasize enhancing native vegetation cover, stabilizing channels by non-structural means, minimizing adverse effects from the existing road network, and carrying out activities identified in landscape analysis. Post-wildfire operations shall minimize the exposure of bare soil.*

This Standard and Guideline is not applicable to this project.

113. *Allow hazard tree removal within RCAs. Allow mechanical ground disturbing fuels treatments, salvage harvest, or commercial fuelwood cutting within RCAs when the activity is*

consistent with RCOs. Utilize low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions to operate off of existing roads when needed to achieve RCOs. Ensure that existing roads, landings, and skid trails meet Best Management Practices. Minimize the construction of new skid trails or roads for access into RCAs for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazard tree removal.

Vegetation and fuels management activities within the designated RCAs, proposed by both action alternatives in the Sagehen Project, are consistent with RCOs. All activities within the designated RCAs are to be implemented according to the guidelines presented for the emphasis area and/or unit prescription.

114. *As appropriate, assess and document aquatic conditions following the Regional Stream Condition Inventory protocol prior to implementing ground disturbing activities within suitable habitat for the California red-legged frog, Cascade frog, Yosemite toad, foothill and mountain yellow-legged frogs, and northern leopard frog.*

The Sagehen Project is not expected to have measurable changes to stream channel characteristics due to the project design, implementation of SMRs and implementation of BMPs, therefore, a SCI protocol specific to the project was determined unnecessary (refer to Aquatics BE, general effects to aquatic indicator discussion).

116. *Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campground, special use permits, grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic and riparian- dependent species. At the project level, evaluate and consider actions to ensure consistency with standards and guidelines or desired conditions.*

There is no landscape analysis being conducted under this proposed action. Only roads that are proposed to be used in association with project activities are included in the transportation plan and are evaluated under this project's purpose. Areas used under this proposed action were designed to be improved where economically feasible as described under RCO#1. Areas identified at the project level analysis were incorporated as actions. The BMPs covered under SMRs (1, 2, 4, 5, 7, 9, 11, 14, 17, 18, 31, 33, 39, 40 and 45) are some of the provisions provided to reduce the potential for impacts to water quality or habitat for aquatic and riparian-dependent species.

All remaining Standard and Guidelines associated with RCO #4 are not applicable to this project.

RIPARIAN CONSERVATION OBJECTIVE #5*: Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas. (RCO #5 is linked to the following AMS goals: #1: Water Quality; #2: Species Viability; #3 Plant and Animal Community Diversity; #4: Special Habitats; #7: Watershed Condition; #9: Stream Banks and Shorelines)*

All special aquatic features identified within the project area including ponds and springs would be protected during the proposed vegetation and fuels management activities. Alternative 1

actions including; the aspen treatment, proposed restoration, fuels activities and emphasis area design consider the existing aquatic feature conditions and these actions are expected to enhance or maintain the existing conditions of special aquatic features. SMRs also applicable to Alternative 3 would also protect special aquatic features. Measures including downed wood retention, snag provisions, and increased fire return intervals under prescribed fire provide the ecological conditions and ecologic processes to maintain or enhance the special aquatic features.

All remaining Standard and Guidelines associated with RCO #5 are not applicable to this project.

RIPARIAN CONSERVATION OBJECTIVE #6*: Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species. (RCO #6 is linked to all AMS goals)*

The Proposed Action Alternative of the Sagehen Project has identified restoration actions to enhance existing conditions while maintaining water quality and while enhancing habitat for species that utilize the adjacent uplands associated with riparian features. These actions are discussed under RCO#2.

122. *Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices, for example, road building, recreational use, grazing, and timber harvests that may be contributing to the observed degradation.*

The road management objectives (RMO) process was used for roads within the Sagehen Project area. A survey of 158 miles of road was conducted in the Truckee River Corridor Area (Highway 89 South Area), Sagehen Watershed, and the Stampede Area using the Soil & Water Roads Condition Inventory (SWRCI) protocol which rates road segments as functional, at-risk, or impaired as part of the strategy to identify problem areas. Inventory findings within the Sagehen Basin boundaries were discussed under RCO #1 and #2. These improvements will be completed as time and money allow where they are not part of this proposed action. Maintenance of haul roads will improve some of the area roads identified in this survey where they are common with the proposed action. For more information on roads associated with the proposed action refer to the Sagehen Project Hydrology Report.

All remaining Standard and Guidelines associated with RCO #6 are not applicable to this project.

Conclusion:

Both action alternatives of the proposed Sagehen Project are consistent with the Aquatic Management Strategy for the Sierran Forests, as required by the Sierra Nevada Forest Plan Amendment ROD (USDA 2004). This project also incorporates LRMP Standards and Guidelines, Soil Quality Standards, and Best Management Practices designed to meet the Riparian Conservation Objectives as described in this document. The identified standards and guidelines with associated mitigation measures are designed to protect downstream beneficial water uses. The potential for direct, indirect, and cumulative effects from the proposed project

would be minimized with proper implementation of identified protection measures.

Literature Cited:

California Regional Water Quality Control Board Lahontan Region, 2000. Water quality control plan for the Lahontan Region North and South Basins. State of California, South Lake Tahoe, CA.

North M, et.al. 2009. An ecosystem management strategy for Sierran mixed-conifer forests. General Technical Report PSW-GTR-220. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA, p 49.

SERA (Syracuse Environmental Research Associates, Inc). 2006. Human Health and Ecological Risk Assessment for Borax (Sporax®) Final Report. Dr. Pat Durkin, Ph.D., Dr. Julie Klotzbach, authors. February 24, 2006. Unpublished. SERA TR 04-43-21/06-30-02b.

E.C.Underwood, et.al. 2010. Using Topography to Meet Wildlife and Fuels Treatment Objectives in Fire-Suppressed Landscapes. Environmental Management (2010) 46:809–819 DOI 10.1007/s00267-010-9556-5. Published online: 25 September 2010.

USDA Forest Service, Tahoe National Forest. 1990. Land and Resource Management Plan. Pacific Southwest Region, USDA Forest Service. Nevada City, CA.

USDA Forest Service. 1999. Eight Eastside Rivers Wild and Scenic River Study Report and Final Environmental Impact Statement Record of Decision. Nevada City, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Region, Tahoe National Forest and Lake Tahoe Basin Management Unit.

USDA Forest Service Pacific Southwest Region. 2004. Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement Record of Decision. Region 5, Vallejo, CA.

Table 3 Proposed Action Alternative RCA by Emphasis Area

Emphasis Area (within units)	Perennial acres	Seasonal acres	Special Aquatic Features (Meadow, spring, fen) acres	Total RCA acres
001				
Manual	16.1	9.1	18.8	44
Mechanical	0.4	45.3	14.2	59.9
Total	16.5	54.4	33	103.9
002				
Manual	51.4	20.9	8.1	80.4
Mechanical	0	4.5	0	4.5
Total	51.4	25.4	8.1	84.9
004				
Manual	17.3	14.6	35.1	67
Mechanical	0.4	45.7	20.5	66.6
Total	17.7	60.3	55.6	133.6
005				
Manual	1.7	20.4	2.3	24.4
Mechanical	2.1	130	65.0	197.1
Total	3.8	150.4	67.3	221.5
006				
Manual	0.6	10.3	5.4	16.3
Mechanical	2.0	34.1	58.1	94.2
Total	2.6	44.4	63.5	110.5
007				
Manual	0	0	0	0
Mechanical	0	3.6	0.5	4.1
Total	0	3.6	0.5	4.1
008				
Manual	4.2	0.4	0.5	5.1
Mechanical	0	0	1.0	1
Total	4.2	0.4	1.5	6.1
Subtotal				
Manual	91.3	75.7	70.2	237.2
Mechanical	4.9	263.2	159.3	427.4
Grand Total	96.2	338.9	229.5	664.6

Table 4 RCA Table by Watershed Alternative 1

Table 4 A: Upper Sagehen Perennial Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Perennial	1	Mechanical Thin and Underburn	0.4
		Hand pile, Pile burn and Underburn	5.4
	2	Hand pile, Pile burn	1.6
		Hand pile, Pile burn and Underburn	26.1
	4	Mechanically thin Grapple Pile, Pile Burn	0.4
	5	Mechanically thin Grapple Pile, Pile Burn and Underburn	0.5
	6	Mechanically thin Grapple Pile, Pile Burn	2.0
		Hand pile, Pile burn and Underburn	0.3
	8	Aspen Restoration Hand pile, Pile burn	4.2
Total			40.9

Table 4B: Upper Sagehen Special Aquatic Features Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Special Aquatic Features (Meadow, springs, Fen)	1	Variable Mechanical Thin Grapple Pile, Pile Burn	11.3
		Mechanically thin Grapple Pile, Pile Burn and Underburn	2.9
		Hand pile, Pile burn and Underburn	1.7
	2	Hand pile, Pile burn and Underburn	1.8
	4	Underburn	27.8
		Variable Mechanical Thin Grapple Pile, Pile Burn	20.5
	5	Mechanically Thin Plantation, Mastication	8.4
		Mechanical Thin Plantation, Mastication and Underburn	35.0
		Underburn	1.0
		Variable Mechanical Thin, Mastication	5.2
		Variable Mechanical Thin Grapple Pile, Pile Burn	0.6

		Variable Mechanically Thin Grapple Pile, Pile Burn, Underburn	8.2
	6	Mechanically Thin Plantation, Mastication	11.8
		Mechanical Thin Plantation, Mastication and Underburn	12.0
		Hand pile, Pile burn and Underburn	3.6
		Variable Mechanically Thin, Mastication	31.9
		Variable Mechanically Thin Grapple Pile, Pile Burn	2.4
	8	Aspen Hand Pile, Pile Burn	0.5
		Aspen Mechanical Thin	1.0
Total			187.6

Table 4 C: Upper Sagehen Seasonal Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Seasonal	1	Variable Mechanical Thin Grapple Pile, Pile Burn	27.5
		Mechanically thin Grapple Pile, Pile Burn and Underburn	0.8
	2	Hand pile, Pile Burn	3.2
		Hand pile, Pile Burn and Underburn	10.8
		Variable Mechanical Thin Grapple Pile, Pile Burn	4.5
	4	Variable Mechanical Thin Grapple Pile, Pile Burn	28.8
		Underburn	6.0
	5	Mechanically Thin Plantation, Mastication	3.9
		Mechanical Thin Plantation, Mastication and Underburn	26.0
		Underburn	1.8
		Variable Mechanical Thin, Mastication	0.8
		Variable Mechanical Thin Grapple Pile, Pile Burn	12.8
		Variable Mechanically Thin Grapple Pile, Pile Burn, Underburn	11.6
		Underburn	0.2
	6	Mechanically Thin Plantation, Mastication	2.9

		Hand pile, Pile burn and Underburn	3.2
		Variable Mechanically Thin, Mastication	3.0
		Variable Mechanically Thin Grapple Pile, Pile Burn	6.4
		Underburn	13.8
	7	Variable Mechanically Thin, Mastication	0.1
		Variable Mechanically Thin Grapple Pile, Pile Burn	0.5
	8	Aspen Hand Pile, Pile Burn	0.4
Total			169

Table 4D: Lower Sagehen Perennial Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Perennial	1	Hand pile, Pile Burn	9.2
		Hand pile, Pile Burn and Underburn	1.5
	2	Hand pile, Pile Burn	9.9
		Hand pile, Pile Burn and Underburn	13.9
	4	Hand pile, Pile Burn	6.0
		Hand pile, Pile Burn and Underburn	11.2
	5	Mechanically Thin Plantation, Mastication	1.6
		Hand pile, Pile Burn	0.8
		Hand pile, Pile Burn and Underburn	0.9
	6	Hand pile, Pile Burn and Underburn	0.3
Total			55.3

Table 4E: Lower Sagehen Special Aquatic Features Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Special Aquatic Features (Meadow, springs, Fen)	1	Hand pile, Pile Burn	14.0
		Hand pile, Pile Burn and Underburn	3.1
	2	Hand pile, Pile Burn	1.5
		Hand pile, Pile burn and Underburn	4.8
	4	Underburn	3.7
		Hand pile, Pile Burn	1.2

		Hand pile, Pile burn and Underburn	2.3
	5	Mechanically Thin Plantation, Mastication	3.5
		Mechanical Thin Plantation, Mastication and Underburn	4.2
		Hand pile, Pile Burn	0.2
		Hand pile, Pile burn and Underburn	1.1
	6	Hand pile, Pile burn and Underburn	1.8
	7	Mechanical Thin Plantation, Mastication and Underburn	0.5
Total			41.9

Table 4F: Lower Sagehen Seasonal Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Seasonal	1	Hand pile, Pile Burn	8.5
		Hand pile, Pile Burn and Underburn	0.6
	2	Hand pile, Pile Burn	0.4
		Hand pile, Pile Burn and Underburn	6.5
	4	Hand pile, Pile Burn	3.6
		Underburn	10.9
		Variable Mechanical Thin and Underburn	5.2
		Variable Mechanical Thin Grapple Pile, Pile Burn	1.6
	5	Mechanically Thin Plantation, Mastication	4.0
		Mechanically Thin Plantation, Mastication, and Underburn	34.0
		Hand pile, Pile Burn	2.8
		Hand pile, Pile Burn and Underburn	4.1
		Variable Mechanically Thin Grapple Pile, Pile Burn	2.5
		Mechanically Thin and Underburn	12.1
	6	Mechanically Thin Plantation, Mastication	1.8
		Mechanical Thin Plantation, Mastication and Underburn	5.2
		Hand pile, Pile Burn and Underburn	7.1

		Variable Mechanically Thin Grapple Pile, Pile Burn	0.3
		Underburn	0.7
	7	Mechanical Thin Plantation, Mastication and Underburn	0.2
		Variable Mechanically Thin and Underburn	0.1
Total			112.2

Table 4G: Saddle Meadow Seasonal Alternative 1

RCA Feature	Emphasis Area	Activity	Acres
Seasonal	1	Mechanical Thin and Underburn	17.0
	4	Mechanical Thin and Underburn	4.1
	5	Mechanical Thin and Underburn	22.1
		Underburn	11.8
	7	Mechanical Thin and Underburn	2.8
Total			57.8

Table 5 Alternative 3 RCA by Emphasis Area				
Emphasis Area (within units)	Perennial acres	Seasonal acres	Special Aquatic Features (Meadow, spring, fen) acres	Total RCA acres
001				
Manual	16.1	9.1	18.8	44
Mechanical	0	0	0	0
Total	16.1	9.1	18.8	44
002				
Manual	51.4	20.9	8.1	80.4
Mechanical	0	0	0	0
Total	51.4	25.4	8.1	80.4
004				
Manual	17.3	14.6	35.1	67
Mechanical	0	0	0	0
Total	17.7	14.6	35.1	67
005				
Manual	1.7	8.7	2.3	12.7
Mechanical	1.6	64	42.6	108.2
Total	3.3	72.7	44.9	120.9
006				
Manual	0.6	10.3	5.4	16.3
Mechanical	0	7.1	12.0	19.1
Total	0.6	17.4	17.4	35.4
007				
Manual	0	0	0	0
Mechanical	0	0.2	0.5	0.7
Total	0	0.2	0.5	0.7
008				
Manual	0	0	0	0
Mechanical	0	0	0	0
Total	0	0	0	0
Subtotal				
Manual	87.1	63.6	69.7	220.4
Mechanical	1.6	71.3	55.1	128
Grand Total	88.7	134.9	124.8	348.4

Table 6A: Upper Sagehen Perennial Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Perennial	1	Hand pile, Pile burn and Underburn	5.4
	2	Hand pile and Pile Burn	1.6
		Hand pile, Pile burn and Underburn	26.1
	6	Hand pile, Pile burn and Underburn	0.3
Total			33.4

Table 6B: Upper Sagehen Special Aquatic Features Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Special Aquatic Features (Meadow, springs, Fen)	1	Hand pile, Pile burn, and Underburn	1.7
	2	Hand pile, Pile burn and Underburn	1.8
	4	Underburn	27.8
	5	Mechanical Thin Plantation, Mastication and Underburn	35
		Underburn	1.0
	6	Mechanical Thin Plantation, Mastication and Underburn	12.0
		Hand pile, Pile burn and Underburn	3.6
Total			82.9

Table 6C: Upper Sagehen Seasonal Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Seasonal	2	Hand pile, Pile Burn	3.2
		Hand pile, Pile Burn and Underburn	10.8
	5	Mechanical Thin Plantation, Mastication and Underburn	26.0
		Underburn	1.8
	6	Hand pile, Pile burn and Underburn	3.2
Total			45

Table 6D: Lower Sagehen Perennial Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Perennial	1	Hand pile, Pile Burn	9.2
		Hand pile, Pile Burn and Underburn	1.5
	2	Hand pile, Pile Burn	9.9
		Hand pile, Pile Burn and Underburn	13.9
	4	Hand pile, Pile Burn	6.0
		Hand pile, Pile Burn and Underburn	11.2
	5	Mechanically Thin Plantation, Mastication	1.6
		Hand pile, Pile Burn	0.8
		Hand pile, Pile Burn and Underburn	0.9
	6	Hand pile, Pile Burn and Underburn	0.3
Total			55.3

Table 6E: Lower Sagehen Special Aquatic Features Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Special Aquatic Features (Meadow, springs, Fen)	1	Hand pile, Pile Burn	14
		Hand pile, Pile Burn and Underburn	3.1
	2	Hand pile, Pile Burn	1.5
		Hand pile, Pile burn and Underburn	4.8
	4	Underburn	3.7
		Hand pile, Pile burn	1.2
		Hand pile, Pile burn and Underburn	2.3
	5	Mechanically Thin Plantation, Mastication	3.5
		Mechanical Thin Plantation, Mastication and Underburn	4.2
		Hand pile, Pile Burn	0.2
		Hand pile, Pile burn and Underburn	1.1
	6	Hand pile, Pile burn and Underburn	1.8
	7	Mechanical Thin Plantation, Mastication and Underburn	0.5
Total			41.9

Table 6F: Lower Sagehen Seasonal Alternative 3

RCA Feature	Emphasis Area	Activity	Acres
Seasonal	1	Hand pile, Pile Burn	8.5
		Hand pile, Pile Burn and Underburn	0.6
	2	Hand pile, Pile Burn	0.4
		Hand pile, Pile Burn and Underburn	6.5
	4	Underburn	10.9
		Hand pile, Pile Burn	3.6
	5	Mechanically Thin Plantation, Mastication	4.0
		Mechanically Thin Plantation, Mastication, and Underburn	34
		Hand pile, Pile Burn	2.8
		Hand pile, Pile Burn and Underburn	4.1
	6	Mechanically Thin Plantation, Mastication	1.8
		Mechanical Thin Plantation, Mastication and Underburn	5.2
		Hand pile, Pile Burn and Underburn	7.1
	7	Mechanical Thin Plantation, Mastication and Underburn	0.2
Total			89.7